

CLAIMS

Please cancel claims 1-8, 10-14, 16-26, 28-29, 31-37, 40-41, 43-46, 48-49, 51-55, 57-60, 77, and 82-106 without prejudice or disclaimer and please add new claims as shown in the following claim listing.

1-106. (Canceled).

107. (New) An apparatus comprising:

non-volatile cache memory; and

a controller to control access to a rotating storage device in response to requests, the controller to spin down the rotating storage device, to queue one or more operations for the rotating storage device, to spin up the rotating storage device to perform a read operation for a read request in response to a miss in non-volatile cache memory for the read request, and to perform one or more queued operations for the rotating storage device in response to the miss.

108. (New) The apparatus of claim 107, wherein the controller is to queue one or more operations for the rotating storage device while the rotating storage device is spun down.

109. (New) The apparatus of claim 107, wherein the controller is to spin down the rotating storage device after performance of the read operation and one or more queued operations.

110. (New) The apparatus of claim 107, wherein queued operation(s) for the rotating storage device comprise a write operation.

111. (New) The apparatus of claim 107, wherein queued operation(s) for the rotating storage device comprise a prefetch operation.

112. (New) The apparatus of claim 107, wherein the controller is to determine if prefetch is desirable in response to the read request and is to perform a prefetch if prefetch is desirable.

113. (New) The apparatus of claim 107, wherein the controller is to determine if the read request is for a sequential stream and is to perform a prefetch if the read request is for a sequential stream.

114. (New) The apparatus of claim 107, wherein the controller is to determine if one or more queued operations for the rotating storage device are desirable.

115. (New) The apparatus of claim 107, wherein the controller is to perform one or more queued operations for the rotating storage device after the read operation.

116. (New) The apparatus of claim 107, wherein the non-volatile cache memory comprises ferroelectric memory.

117. (New) The apparatus of claim 107, wherein the non-volatile cache memory comprises polymer memory.

118. (New) The apparatus of claim 107, wherein the controller comprises software.

119. (New) The apparatus of claim 107, comprising a general-purpose processor, wherein the controller comprises software comprising a driver for execution by the general-purpose processor.

120. (New) The apparatus of claim 107, wherein the controller comprises software for execution on a host processor.

121. (New) The apparatus of claim 107, wherein the controller comprises a hardware controller device.

122. (New) The apparatus of claim 107, wherein the controller comprises a digital signal processor.

123. (New) The apparatus of claim 107, wherein the controller comprises an application specific integrated circuit.

124. (New) The apparatus of claim 107, wherein the controller resides coincident with non-volatile cache memory.

125. (New) The apparatus of claim 107, wherein the memory controller resides separately from both non-volatile cache memory and the rotating storage device.

126. (New) A method comprising:
spinning down a rotating storage device;
queuing one or more operations for the rotating storage device; and
in response to a miss in non-volatile cache memory for a read request, spinning up the rotating storage device and performing a read operation for the read request and one or more queued operations for the rotating storage device.

127. (New) The method of claim 126, wherein queuing one or more operations for the rotating storage device comprises queuing one or more operations while the rotating storage device is spun down.

128. (New) The method of claim 126, comprising spinning down the rotating storage device after performing the read operation and one or more queued operations.

129. (New) The method of claim 126, wherein performing one or more queued operations for the rotating storage device comprises performing a write operation.

130. (New) The method of claim 126, wherein performing one or more queued operations for the rotating storage device comprises performing a prefetch operation.

131. (New) The method of claim 126, comprising determining if prefetch is desirable in response to the read request and performing a prefetch if prefetch is desirable.

132. (New) The method of claim 126, comprising determining if the read request is for a sequential stream and performing a prefetch if the read request is for a sequential stream.

133. (New) The method of claim 126, comprising determining if one or more queued operations for the rotating storage device are desirable.

134. (New) The method of claim 126, comprising performing one or more queued operations for the rotating storage device after the read operation.

135. (New) The method of claim 126, wherein the non-volatile cache memory comprises ferroelectric memory.

136. (New) The method of claim 126, wherein the non-volatile cache memory comprises polymer memory.

137. (New) A system comprising:
a hard disk drive;
non-volatile cache memory; and

a controller to control access to the hard disk drive in response to requests, the controller to spin down the hard disk drive, to queue one or more disk operations, to spin up the hard disk drive to perform a disk read operation for a read request in response to a miss in non-volatile cache memory for the read request, and to perform one or more queued disk operations in response to the miss.

138. (New) The system of claim 137, wherein the controller is to queue one or more disk operations while the hard disk drive is spun down.

139. (New) The system of claim 137, wherein the controller is to spin down the hard disk drive after performance of the disk read operation and one or more queued disk operations.

140. (New) The system of claim 137, wherein queued disk operation(s) comprise a disk write operation.

141. (New) The system of claim 137, wherein queued disk operation(s) comprise a prefetch operation.

142. (New) The system of claim 137, wherein the controller is to determine if prefetch is desirable in response to the read request and is to perform a prefetch if prefetch is desirable.

143. (New) The system of claim 137, wherein the controller is to determine if the read request is for a sequential stream and is to perform a prefetch if the read request is for a sequential stream.

144. (New) The system of claim 137, wherein the controller is to determine if one or more queued disk operations are desirable.

145. (New) The system of claim 137, wherein the controller is to perform one or more queued disk operations after the disk read operation.

146. (New) The system of claim 137, wherein the non-volatile cache memory comprises ferroelectric memory.

147. (New) The system of claim 137, wherein the non-volatile cache memory comprises polymer memory.

148. (New) The system of claim 137, wherein the system comprises a personal computer, a server, a workstation, a router, a switch, a network appliance, a handheld computer, an instant messaging device, a pager, or a mobile telephone.